the moon is above the horizon, has twice the amount at the lower station which it has at the upper station.

This curious result, which it is difficult to explain by any theory depending simply on the attraction of gravitation, whether acting on the sea or the atmosphere, agrees remarkably with the conclusions for the solar diurnal oscillation obtained from the discussion of hourly observations made simultaneously during a month at five different stations, four of these being on the Agustier mountains, rising gradually from 1200 to 6200 feet, the fifth station being at Trevandrum. From these observations (an abstract of which will be found noticed in the Report of the British Association for 1859, Trans. of Sect., p. 46), it appeared that the solar semidiurnal oscillation between 9 P.M. and 9 A.M. was nearly the same at all the stations; while the day oscillation, 9 A.M. to 9 P.M., diminished with the height, being at 6200 feet little more than half the amount of the oscillation at 200 feet.

These facts might be put into the following general form :—When the heavenly body (sun or moon) is *below the horizon,* the semidiurnal oscillation of the barometer within the tropics has the same value at all heights up to 6200 feet; but when the body is *above the horizon,* the oscillation at 6200 feet has only half the amount of the oscillation at the level of the sea.

II. "On the Law of Disturbance and the Range of the Diurnal Variation of Magnetic Declination near the Magnetic Equator, with reference to the Moon's Hour-angle." By JOHN ALLAN BROUN, Esq., F.R.S., Director of the Trevandrum Observatory. Received May 30, 1861.

The discovery by Dr. Lamont of a "decennial" period in the range of the solar diurnal variation of magnetic declination, naturally leads to the question whether a similar law may not exist for the lunar diurnal variation; the question is also of importance in connexion with the theory of the cause of these variations. The following results for the range of the lunar diurnal variation were obtained from the discussion whose conclusions were given in the Proceedings of the Royal Society, vol. x. p. 475.

The Royal Society is collaborating with JSTOR to digitize, preserve, and extend access to *Proceedings of the Royal Society of London.* www.jstor.org

Range of Diurnal Variation at Trevandrum, 1854–59.

Year.	Lunar. From variations for groups of 3 months.	Solar. From variations for single months.	Ratio. $\frac{\text{Solar}}{\text{Lunar}}$
1854	0′·52	2′·24	4·3
1855	0·54	2·05	3·6
1856	0·41	2·01	4·9
1857	0·53	2·15	4·0
1858	0·58	2·41	4·2
1859	0·66	2·64	4·0

It appears from these values that the range of the lunar diurnal period varies from year to year according to the same law (nearly) as the range of the solar diurnal period; and we may conclude that the range of lunar diurnal variation obeys the "decennial" law.

It is well known that the declination needle obeys two diurnal laws due to the solar action; the first of these governs the movement of the north end of the needle from east to west and from west to east, the second determines a superposed movement resulting from the relative amounts of displacement of the needle from its normal position at each hour; the latter is usually termed the diurnal law of disturbance. In order to obtain this law and the values of the disturbance, the quantities d_0, d_1, d_2 .... (Proceedings, vol. x. p. 477) are summed for each hour and the means are taken. No similar investigation, as far as I am aware, has as yet been undertaken for the lunar diurnal variation.

I have now arrived at the following conclusions in the discussion for this object of six years' observations of magnetic declination made at the Trevandrum Observatory.

Having arranged the differences containing the lunar effect,

$$\begin{array}{llll} d_0' & d_1' & d_2' & \ldots\ldots \\ d_0'' & d_1'' & d_2'' & \ldots\ldots \\ \vdots & \vdots & \vdots & \end{array}$$

according to the moon's hour-angles from the meridian, and obtained the means,

$$\frac{\Sigma d_0}{n-1} = h + \frac{\Sigma_{23}^{0}(x')}{n-1},\ \frac{\Sigma d_1}{n-1} = h_1 + \frac{\Sigma_{23}^{0}(x'')}{n-1} \ \ldots\ldots,$$

the second differences

$$\begin{array}{ll} d_0' - (h_0), & d_1' - (h_1) \ldots\ldots \\ d_0'' - (h_0), & d_1'' - (h_1) \ldots\ldots \\ \vdots & \vdots \end{array}$$

were taken; these differences, as in the case of the similar investigation for the solar laws, represent the disturbance at each hour-angle of the moon; and when the means of the second differences are taken, the law of the lunar diurnal disturbance will be obtained, if any such law exist.

The small range of the regular lunar diurnal variation, and the derangement produced by the larger disturbances, the effects of which cannot be eliminated in short series of observations, would render identical results from different groups of years improbable, especially if the range of the variation to be determined be small. The following conclusions, however, seem sufficiently confirmed by the discussion of different groups of observations to be accepted.

There is a lunar-diurnal law of disturbance which, from the mean of six years' observation, consists of a

Principal maximum 5 hours before the moon passes the upper meridian.

Principal minimum near the moon's passage of the lower meridian.

Secondary maximum 6 hours after the passage of the upper meridian.

Secondary minimum 1 hour after the passage of the upper meridian.

When the results for each year are compared, the principal maximum and minimum are always shown distinctly; but the values and epochs of the secondary maximum and minimum vary, and that so irregularly, that in the mean for the three years 1857–59 the existence of either is doubtful, only the principal maximum and minimum being well-marked.

In order to determine if the law varied with season, means of groups for quarters of the year were obtained; means also for the groups of half-years, October to March and April to September, were taken. As the results for the quarters forming each half-year agreed with each other, and that for the half-year which contained them, the following conclusions may be accepted as probably true.

Half-year October to March.

Principal maximum, 5½ hours before the moon's passage of the upper meridian.

Principal minimum, 3 hours before the moon's passage of the lower meridian.

Secondary maximum, 5½ hours after the moon's passage of the upper meridian.

Secondary minimum, 1 hour after the moon's passage of the upper meridian.

Half-year April to September.

Maximum, 4¼ hours before the moon's passage of the upper meridian.
Minimum, at the passage of the lower meridian.

In the case of the half-year including the June solstice, the secondary points disappear; this also is the case for each of the quarters forming the half-year. It may be due to this and the preponderance of the disturbance in one half of any given year, that the mean for the whole year shows distinctly or indistinctly the secondary points: the question, however, of the secondary points will be considered hereafter in another discussion including a longer series of observations.

The mean value of the lunar disturbance of magnetic declination for the six years 1854–59 at Trevandrum .. } =0′·341

The maximum value at 5 hours before the upper passage =0′·363

The minimum value near the inferior passage ...... =0′·324

So that the variation of the mean law is only 0′·04, or about two seconds and a half.

When we examine the means for the separate years, we find

	Mean Lunar Disturbance.	Ratio to 1856.	Ratio of range of diurnal variation to 1856.
1854	=0′·320	1·18	1·27
1855	0·295	1·08	1·31
1856	0·272	1·00	1·00
1857	0·326	1·20	1·28
1858	0·379	1·39	1·41
1859	0·453	1·67	1·59

I have not at hand the mean solar disturbances for each year, and cannot therefore compare the two; it will appear, however, from a comparison with the ranges of the solar diurnal variation (which are known to follow nearly the same law as the law of mean disturbance), that the mean lunar disturbance obeys the same law as the mean solar disturbance, and that the former is probably dependent upon the latter.

III. "Experimental Researches on the Functions of the Vagus and the Cervical Sympathetic Nerves in Man." By AUGUSTUS WALLER, M.D., F.R.S. Received June 6, 1861.

The offices of these two nerves in the animal economy are of such importance as to render it a matter of practical interest to the physician, as well as to the physiologist, to obtain as clear an insight as possible into their functions. It would be impossible to point out any nerves presenting so many questions of daily importance to the practitioner as these, which govern the innervation of the stomach, the heart, the lungs, and the liver.

Hitherto we have been restricted to their investigation in the lower animals, and from the results which have been thus furnished, we have judged of what obtains in man. It is almost needless for me to point out that, although such inferences are generally correct as regards the *motor* phenomena of life, our evidence respecting the *sensory* functions of the nerves is necessarily more uncertain and inconclusive.

My object at present is to describe some results obtained by irritating the vagus and cervical sympathetic in man, in such a way as to ascertain their functions, not only in a state of health, but also their condition in disease, and in various functional derangements to which they are subject.

The means which I adopt for this purpose are the same as that which I have used in the case of the ulnar nerve and of the retina, *i. e.* mechanical irritation by simple pressure on the trunk of the nerve. I generally apply pressure of the fingers at the highest point of the neck behind the ramus of the lower jaw. A moderate amount of pressure applied in this manner is usually sufficient, in the course of about a minute, to produce symptoms which are at once easily recognized as originating from the irritation of the vagus and the sympathetic nerve.